A lope towards loops: temporal digraphs

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Abstract

The Bodirsky-Kára classification of all tractable temporal constraint languages stands as one of the earliest and most seminal complexity classifications within infinite-domain Constraint Satisfaction Problems (CSPs). We revisit this classification and show that tractable temporal languages have limited expressive power as measured by the graphs they can pp-interpret. This limitation leads to many hitherto unknown algebraic consequences. In particular, we confirm that for temporal constraint languages, the existence of a 4-ary pseudo-Siggers polymorphism is equivalent to the existence of a 6-ary one. While for finite-domain CSPs, the presence of the non-pseudo version of either of these polymorphisms is known to equivalently characterise tractability, the existence of a 6-ary pseudo-Siggers polymorphism has been conjectured, within the Bodirsky-Pinsker conjecture, to separate the hard from the tractable CSPs.